

***What Is Claimed Is:***

1. An isolated nucleic acid molecule, comprising a polynucleotide having a nucleotide sequence at least 95% identical to a sequence selected from the group consisting of:

(a) a nucleotide sequence of an open reading frame depicted in one of Tables 1 through 4;

(b) a nucleotide sequence beginning with the first initiation codon encountered reading 5' to 3' in an open reading frame depicted in one of Tables 1 through 4, and ending with the 3' terminal stop codon;

(c) a nucleotide sequence beginning with the first initiation codon encountered reading 5' to 3' in an open reading frame depicted in one of Tables 1 through 4, and ending with the nucleotide preceeding the 3' terminal stop codon;

(d) a nucleotide sequence of (a) excluding codons for amino acids eliminated during processing of the putative protein identified in one of Tables 1 through 4; or

(e) a nucleotide sequence that is complementary to any one of the nucleotide sequences in (a), (b), (c), or (d).

2. An isolated nucleic acid molecule of claim 1, wherein said nucleotide sequence is 100% identical to the nucleotide sequence of an open reading frame depicted in Tables 1 through 4, or a complement thereof.

3. An isolated nucleic acid molecule, comprising a polynucleotide that hybridizes under stringent hybridization conditions to a nucleic acid molecule of claim 2.

4. An isolated nucleic acid molecule, comprising a polynucleotide that encodes the amino acid sequence of an epitope-bearing portion of an *E. coli* J96 PAI protein encoded by an open reading frame depicted in one of Tables 1 through 4.

5. A method of making a recombinant vector, comprising inserting an isolated nucleic acid molecule of claim 1 into a vector.

6. A recombinant vector produced by the method of claim 5.

7. A method of making a recombinant host cell, comprising introducing a recombinant vector of claim 6 into a host cell.

8. A recombinant host cell produced by the method of claim 7.

9. A recombinant method for producing an *E. coli* J96 PAI polypeptide, comprising culturing a recombinant host cell of claim 8 under conditions such that said polypeptide is expressed and recovering said polypeptide.

10. An isolated polypeptide having an amino acid sequence at least 95% identical to an amino acid sequence encoded by a uropathogenic *E. coli* J96 pathogenicity island open reading frame depicted in Tables 1 through 4.

11. An isolated polypeptide of claim 10, wherein said amino acid sequence is 100% identical to an amino acid sequence encoded by a uropathogenic *E. coli* J96 pathogenicity island open reading frame depicted in Tables 1 through 4.

12. An isolated polypeptide comprising an immunogenic epitope of an *E. coli* J96 PAI IV or PAI V protein encoded for by an open reading frame depicted in one of Tables 1, 2, 3 or 4.

13. A vaccine, in dosage form, comprising  
(a) a pharmaceutically acceptable diluent, carrier, or excipient, and  
(b) an antigen selected from the group consisting of:

(i) a polypeptide having an amino acid sequence at least 95% identical to an amino acid sequence encoded by a uropathogenic *E. coli* J96 PAI IV or PAI V open reading frame depicted in Tables 1, 2, 3 or 4, and

(ii) a polypeptide comprising an immunogenic epitope of an *E. coli* J96 PAI IV or PAI V protein encoded for by an open reading frame depicted in one of Tables 1, 2, 3 or 4; wherein said antigen is present in an amount effective to elicit protective immune responses in an animal to pathogenic *E. coli*.

14. An isolated antibody that binds specifically to a polypeptide of claim 10.

15. An isolated antibody that binds specifically to a polypeptide of claim 11.

16. An antibody having binding affinity to a polypeptide of claim 12.

17. A method of detecting a pathogenic *E. coli* antigen in a sample, comprising:

- (a) contacting said sample with an antibody according to claim 14 under conditions such that immunocomplexes form, and
- (b) detecting the presence of said antibody bound to said antigen.

18. A method of detecting a pathogenic *E. coli* antigen in a sample, comprising:

- (a) contacting said sample with an antibody according to claim 15 under conditions such that immunocomplexes form, and
- (b) detecting the presence of said antibody bound to said antigen.

19. A diagnostic kit comprising:

- (a) a first container means containing an antibody according to claim 14 and
- (b) a second container means containing a conjugate comprising a binding partner of said antibody and a label.

20. A diagnostic kit comprising:

- (a) a first container means containing an antibody according to claim 15 and
- (b) a second container means containing a conjugate comprising a binding partner of said antibody and a label.

21. A hybridoma which produces an antibody according to claim 14.

22. A hybridoma which produces an antibody according to claim 15.

23. A method of detecting the presence of antibodies to pathogenic *E. coli* in a sample, comprising:

- (a) contacting said sample with a polypeptide according to claim 10 under conditions such that immunocomplexes form, and
- (b) detecting the presence of said antibody bound to said antigen.

24. A method of detecting the presence of antibodies to pathogenic *E. coli* in a sample, comprising:

- (a) contacting said sample with a polypeptide according to claim 11 under conditions such that immunocomplexes form, and
- (b) detecting the presence of said antibody bound to said antigen.

25. A method of detecting the presence of antibodies to pathogenic *E. coli* in a sample, comprising:

- (a) contacting said sample with a polypeptide according to claim 12 under conditions such that immunocomplexes form, and
- (b) detecting the presence of said antibody bound to said antigen.

26. A kit for detecting the presence of antibodies to pathogenic *E. coli* in a sample comprising at least one container means having disposed therein a polypeptide according to claim 10.

27. A kit for detecting the presence of antibodies to pathogenic *E. coli* in a sample comprising at least one container means having disposed therein a polypeptide according to claim 11.

28. A kit for detecting the presence of antibodies to pathogenic *E. coli* in a sample comprising at least one container means having disposed therein a polypeptide according to claim 12.

29. Computer readable medium having recorded thereon one or more nucleotide sequences depicted in SEQ ID NOs: 1 through 142, or nucleotide sequences at least 99.9% identical thereto.

30. Computer readable medium having recorded thereon a nucleotide sequence of at least one uropathogenic *E. coli* J96 pathogenicity island open reading frame depicted in Tables 1 through 4, or a complement thereof.

31. The computer readable medium of claim 29, wherein said medium is selected from the group consisting of a floppy disc, a hard disc, random access memory (RAM), read only memory (ROM), and CD-ROM.

32. The computer readable medium of claim 30, wherein said medium is selected from the group consisting of a floppy disc, a hard disc, random access memory (RAM), read only memory (ROM), and CD-ROM.

33. A computer-based system for identifying fragments of uropathogenic *E. coli* J96 pathogenicity islands PAI IV and PAI V that are homologous to target nucleotide sequences, comprising:

a) a data storage means comprising a nucleotide sequence of SEQ ID NOs: 1 through 142, or a nucleotide sequence at least 99.9% identical thereto;

- b) a search means for comparing a target sequence to said nucleotide sequence of said data storage means of step (a) to identify a homologous sequence, and
- c) a retrieval means for obtaining said homologous sequence of step (b).